

**Asymmetric Catalysis Based on Chiral Phospholanes and Hydroxyl  
Phospholanes**

**BACKGROUND OF THE INVENTION**

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11/4/05  
This application is a Continuation-in-Part of, and claims priority from U.S.  
APPL. N. 09/992,557 FILED 11/6/01 NOW US 6,727,371, WHICH  
NOW US 6,337,406

IS A CONTIN OF Application Serial No. 09/377,065, filed on August 19, 1999 and claims priority from  
U.S. Provisional Application Serial No. 60/097,473, filed on August 21, 1998.  
M ~~US 6,727,377~~

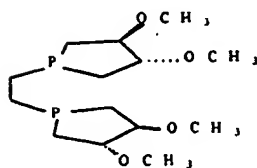
**Field of the Invention**

This invention relates to chiral phospholanes derived from natural products, and asymmetric catalysis using these phospholanes.

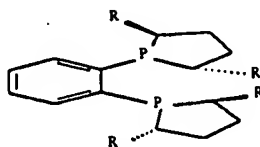
**Description of Related Art**

Many chiral phosphine ligands have been explored for practical application in asymmetric catalysis, but few chiral ligands or motifs are efficient for the synthesis of commercially useful chiral molecules in industry.

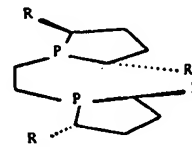
Among known chiral phosphines, several are made from electron-donating chiral phospholanes. One example is the Brunner phospholane shown below. Brunner, H., Organometal. Chem. (1987) 328, 71. However, poor enantioselectivities were observed.



**Brunner phospholane**



**DuPhos<sup>TM</sup>**



**BP**

The ligands DuPhos<sup>TM</sup> and BPE have been used effectively for certain asymmetric hydrogenation reactions. See U.S. Patent Nos. 5,329,015; 5,202,493; and 5,329,015; Burk, M.J., J. Am. Chem. Soc. (1991) 113, 8518; Burk, M.J., J. Am.